EM477 - Computer-Aided Design
Mechanism Design Project
Fall 2001

The Design Project that Really Rocks!

Introduction: Many people with arthritis or other physical disabilities find it difficult or painful to exert the effort needed to power a simple rocking chair. Recently, an Assistive Technology Consultant from the Western Pennsylvania School for Blind Children inquired about the possibility of designing a powered rocking chair for use by one of their students who has cerebral palsy and cannot use his feet to push a conventional rocker. Evidently no commercial product exists that fulfils this apparent need in the marketplace.

The Task: You are tasked to design a powered rocking chair using a four-bar mechanism to provide the rocking motion to the seat. A standard chair seat will be provided and each team must design a mechanism that will control the motion of the seat so that the rider experiences the same motion one would get from a traditional Boston rocker. The design process will include:

- determination of appropriate specifications describing the required motion
- synthesis of a suitable four-bar mechanism
- analysis of the kinematics of the mechanism to demonstrate that the mechanism fulfils the required motion
- development of solid models of the mechanism components and assembly, including all support structures
- analysis of the dynamic forces developed in the mechanism
- stress analysis of the components to demonstrate adequate safety factors
- selection of an appropriate motor and design of the associated linkage or gears to drive the mechanism
- complete documentation of all analyses and components, including engineering drawings
- fabrication of a full-scale prototype of the design to demonstrate feasibility

Design Teams: Design teams will consist of 3 or 4 mids per team, depending on section size.

Important Dates:

19 OCT 01	Memorandum report detailing the mechanism synthesis and kinematic analysis of position, velocity and acceleration through the full range of motion.
11 NOV 01	Commence fabrication of components
2 DEC 01	Demonstration of prototypes this week
12 DEC 01	Final design reports due

Design Specifications: The mechanism must produce a motion like that of a traditional rocking chair. Two rocking chairs will be available in Rickover 15 from 19 SEP – 5

OCT for you to use in determining suitable precision points for your mechanism to reproduce. Each teams mechanism will have to attach to a common seat. No permanent modification of the seat is permitted; however, removable brackets or other mounting hardware you design may be attached to the bottom of the seat. The base frame for your mechanism must provide a stable support for the mechanism. It must not interfere with the riders body or feet and may not protrude more than 6 in. beyond the sides of seat.

Grading: The complete project counts towards 55% of your semester grade as indicated in the Course Policy handed out at the beginning of the semester. This is divided up as follows:

Mechanism Design Memo Report	20%
Prototype Fabrication and Performance	15%
Mechanism Design Final Report	20%

All team members will receive the same grade each of these elements. Specific guidance on the requirements for the reports will be distributed shortly and posted on the course syllabus web page.

R.E. Link
Assoc. Professor